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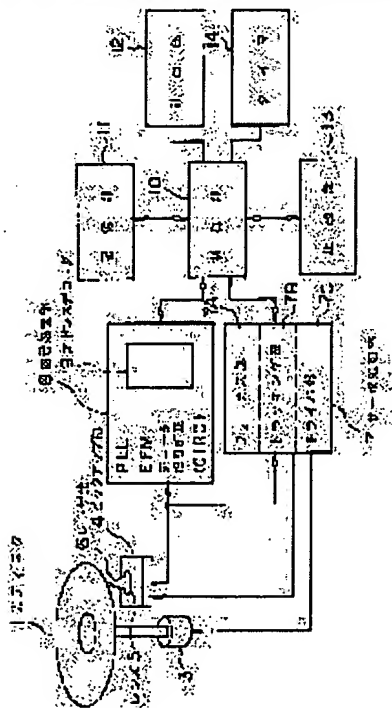
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(54) REPRODUCING DEVICE FOR OPTICAL DISK



(57)Abstract:

PURPOSE: To facilitate discrimination of whether it is a regular optical disk or not by comparing rotational period of a part different in recording transfer rate with rotational period of a part of other usual recording transfer rate.

CONSTITUTION: When the optical disk is a CD-ROM, a pickup part 4 is sought by a prescribed address of a usual track based on information in a storage part 11, and the rotational period of disk of one revolution in the part is measured. Then, the pickup 4 is sought by the address between the addresses of the track on which information is recorded at a low recording transfer rate, and the rotational period of the optical disk is measured. Then, the change rate of the rotational period is obtained in a comparison part 13, and when the change rate is smaller than a prescribed setting value H, a control part 10 recognizes it as a regular disk, and when the

change rate is larger than the setting value H, the control part 10 recognizes it as an irregular disk, and performs copy prevention action such as disk ejection operation, etc.

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CLAIMS

[Claim(s)]

[Claim 1] The regenerative apparatus which plays the optical disk with which the record transfer rate of some trucks differs from the record transfer rate of the usual truck among the trucks which arranged many pit trains characterized by providing the following the shape of a concentric circle, and in the shape of a spiral, and were formed The storage section which memorizes the address currently recorded at a different record transfer rate from the address currently recorded at the record transfer rate of the usual truck, and this record transfer rate The measurement section which measures the rotation period of the aforementioned optical disk in the two aforementioned addresses The comparator which compares the aforementioned rotation period measured in this measurement section based on a predetermined formula The control section which judges whether the aforementioned optical disk is regular based on the comparison result of this comparator

[Claim 2] The record transfer rate of the truck of some above is the regenerative apparatus of the optical disk according to claim 1 characterized by being set up lower than the record transfer rate of the aforementioned usual truck.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the regenerative apparatus with which optical disks, such as CD-ROM (compact disk ROM) information, such as for example, TV (television) game, was remembered to be, confirm whether to be a regular thing, and prevent an illegal copy.

[0002]

[Description of the Prior Art] In conformity with the specification exhibited ["ISO /9660"], formatting of many of optical disks, such as present, for example, CD-ROM etc., is carried out. Stopping the reproduction etc. is performed noting that various kinds of software, such as TV game, will be regular disks if a limit joins the illegal copy prevention measure, for example, the code for copy prevention is recorded beforehand and there is the code at the time of reproduction, and it will be inaccurate copy disks if the code does not exist, when formatting is carried out in conformity with the specification exhibited as mentioned above, although the illegal copy should be prevented from the standpoint of the protection of copyrights.

[0003] However, if the copy machine which copies the data currently written to the logic specification the whole round head with such an illegal copy prevention measure is manufactured, it can copy easily and will not be a not much effective method.

[0004] Although many were making and producing original specification commercially since it was before the above-mentioned specification was materialized, if it was in CD-ROM produced comparatively commercially early, that by which CD-ROM produced commercially now followed this specification becomes in use. Then, weak CD of a copy protection will appear on the market, infestation of an illegal copy is caused, and it is thought that it will be in a state with the same said of CD-ROM type game software especially.

[0005] Then, as a copy prevention measure in new CD, as shown in JP,61-178732,A, form the "pseudo-pit" of a pit smaller than the usual pit in a disk, and a compound output is made to transform by detecting this pseudo-pit, and a copy is prevented.

[0006]

[Problem(s) to be Solved by the Invention] however, the software which reads the usual CD-ROM even if it writes it including a pit as mentioned above even though it writes the code for copy protections based on specification, and it writes a format by the original standard or -- if -- even if it was the case where it could not read, the data in the frame unit of a lower level etc. were read, and according to the copy machine copied to a CD-write-once disk etc., there was a problem that any disks will be copied

[0007] When forming a pseudo-pit especially, since the small pseudo-pit had to be detected, it not only needs strict management from usually forming this pseudo-pit smaller than a pit, and mass-producing, but there was a trouble that detection reliability will also fall. In addition, although the technology which assigned a transfer rate field which is different according to amount of information to the disk with which two or more record transfer rates are intermingled is also developed as related technology as indicated by JP,4-353631,A, this aims at raising optical disk record efficiency, and is not what took a copy prevention measure.

[0008] this invention is originated paying attention to the above troubles that this should be solved effectively, and the purpose is in offering the regenerative apparatus of the optical disk which can prevent an illegal copy certainly.

[0009]

[Means for Solving the Problem] The inside of the truck which arranged many pit trains the shape of a concentric circle, and in the shape of a spiral, and was formed in order that this invention might solve the above troubles, In the regenerative apparatus which plays the optical disk with which the record transfer rate of some trucks differs from the record transfer rate of the usual truck The storage section which memorizes the address currently

recorded at a different record transfer rate from the address currently recorded at the record transfer rate of the usual truck, and this record transfer rate, The measurement section which measures the rotation period of the aforementioned optical disk in the two aforementioned addresses, It has the comparator which compares the aforementioned rotation period measured in this measurement section based on a predetermined formula, and the control section which judges whether the aforementioned optical disk is regular based on the comparison result of this comparator.

[0010]

[Function] Since this invention was constituted as mentioned above, it first seeks the address of some trucks with which the usual truck of an optical disk probably differs from the rate based on the address in the storage section, respectively, and measures the rotation period of the optical disk in each of these addresses by the measurement section. The measured rotation period is compared based on a predetermined formula in a comparator. It is judged that a control section is an optical disk inaccurate if the comparison result to be produced as a result of the above-mentioned comparison if the record transfer rate is changing is shown, when it judges that it is a regular optical disk and the other comparison result is shown since the regular optical disk is recorded on a part for predetermined address part at the record transfer rate from which other portions differed here. As an example of the process of this judgment, in the case of a CLV (Constant Linear Velocity) method, it asks for a rotation period, for example, and whether the rate of change of this rotation period is larger than a predetermined value performs judgment about an optical disk.

[0011]

[Example] Below, one example of the regenerative apparatus of the optical disk concerning this invention is explained in full detail based on an accompanying drawing. The block diagram showing the regenerative apparatus of the optical disk which drawing 1 requires for this invention, the outline plan showing the optical disk by which drawing 2 is reproduced with this invention equipment, and drawing 3 are graphs which show the relation between the address of a regular optical disk, and a rotation period.

[0012] As shown in drawing 2, this optical disk 1 has the truck 2 which arranged many pit trains the shape of a concentric circle, and in the shape of a spiral, and was formed. In the example of illustration, the truck arranged in the shape of a spiral is shown. For example, pit density is smaller than previous pit density, truck 2B of at2 is carried out, specific address at1, for example, address, and truck 2A of the greater part of this truck 2 is recorded at the low record transfer rate, although pit density is enlarged and is recorded at the usual high record transfer rate. Although truck 2B recorded at the low record transfer rate is a part for 1 from the address at1 to at2, or a multiple track and at2 is a part for one truck from the address at1 in the example of illustration, you may make it form this truck over two or more rotations. Thus, let the optical disk which has TORATSU recorded at a partially different record transfer rate from the periphery be a regular thing.

[0013] Although the regenerative apparatus concerning this invention is used in order to play this optical disk, the judgment function which judges whether an optical disk is regular is prepared in this regenerative apparatus. First, installation fixation of the optical disk 1 is carried out at the turntable for which rotation of a spindle motor 3 was attained and which is not illustrated. And the pickup section 4 has the optical system which equipped the interior with the laser oscillation machine or the lens 5, and reads the

recording information of an optical disk side by the laser beam 6.

[0014] The servo processing section 7 consists of focal section 7A and tracking section 7B which control the drive of the pickup section 4, and driver section 7C which controls the drive of a spindle motor 3, and it can control the rotational speed of an optical disk by the CLV (Constant Linear Velocity) method proper while it performs focusing and the tracking of the pickup section 4 to an optical disk 1.

[0015] The data output of the pickup section 4 is connected to the above-mentioned servo processing section 7 and the signal-processing section 8, respectively. This signal-processing section 8 is a portion which regenerates a picture signal, an audio signal, etc., and has the address decoder 9 grade as the digital-error correction section and the address recognition section of a PLL (Phase Locked-Loop) circuit, an EFM (Eight to Fourteen Modulation) decoder, and a CIRC (Cross Interleave Reed-Solomon Code) method which is not illustrated inside.

[0016] As for these signal-processing section 8 and the above-mentioned servo processing section 7, the operation is controlled by the control section 10 which consists of a microcomputer etc. The storage section 11 which records the specific address a of the usual track 2A currently recorded at the high record transfer rate and the specific address b of the track 2Bs currently recorded at the low record transfer rate rather than the above-mentioned record transfer rate and which consists of a ROM etc., for example, and the measurement section 12 which measure the rotation period of the above-mentioned optical disk 1 in each above-mentioned addresses a and b are connected to this control section 10. The above-mentioned specific address b is located among the addresses at [at1 and] 2 so that clearly also from drawing 3 . Furthermore, if two measurement values measured in the above-mentioned measurement section 12 are compared based on a predetermined formula, the comparator 13 will be connected to this control section 10, and based on this comparison result, the above-mentioned control section 10 judges whether the above-mentioned optical disk 1 is regular. Moreover, this control section 10 has the timer 14 for a time check inside.

[0017] Next, operation of this example constituted as mentioned above is explained. Let the optical disk which record transfer rates differed in the middle of the track, for example, the record area made small exists as a regular optical disk is shown in drawing 2 , and includes the other optical disk, for example, all tracks, here, and is recorded at the same record transfer rate be an irregular thing.

[0018] In this example, taking the case of the case where it is the Constant Linear Velocity by which disk rotation is controlled so that the rotational speed falls and the linear velocity of a track always becomes fixed, it explains as the seeking position of the pickup section goes to the method of the outside of radial of an optical disk. First, the laser beam 6 condensed through the lens 5 from the pickup section 4 is irradiated by the optical disk side, and recording information is read by the reflected light. This read-out signal is inputted into the servo processing section 7, and this servo processing section 7 performs control of the focusing and the tracking over the optical disk 1 of the above-mentioned pickup section 4 based on the focal error signal and tracking error signal which are formed here. Simultaneously, this servo processing section 7 carries out CLV control of the spindle motor 3 based on the instructions from a control section 10.

[0019] Moreover, it is inputted also into the signal-processing section 8, and EFM decoding is carried out, or it corrects a digital error and an audio-visual signal etc. is

reproduced, and it is read in this signal-processing section 8, or the informational address is also decoded and the signal read in the pickup section 4 is searched for.

[0020] Next, the case where it is confirmed whether the optical disk 1 used now is regular is explained. First, by being alike therefore, if the recording information of this optical disk is reproduced, since [whose an address value go to the right from the left of a horizontal axis, and increases as shown in drawing 3] it is a Constant Linear Velocity, rotational speed will fall, and a rotation period will rise and go with time. In addition, as for the truck by the side of the center of an optical disk, in this example, the address value is small.

[0021] Since the record transfer rate is small set up from the address at1 to at2 here in the case of the regular optical disk, in order to make a transfer rate regularity, the rotational speed of a disk goes up by this portion, consequently a rotation period falls in it. And when the field between the addresses at [at1 and] 2 is passed, a disk will return to the original rotation period. In drawing 3 , an alternate long and short dash line is crossed to all trucks, and shows transition of the rotation period of an optical disk, i.e., an irregular optical disk, when a record transfer rate is fixed.

[0022] Therefore, the right or wrong of an optical disk can be judged by comparing the rate of change of for example, a rotation period for the rotation period in predetermined Address b, for example, address, of the low trucks of the rotation period (inverse number of rotational speed) in predetermined Address a, for example, address, of the trucks where the usual record transfer rate is high, and a record transfer rate in a predetermined formula.

[0023] If the procedure in check mode is explained based on drawing 4 and drawing 5 , it is judged first whether the optical disk was set in S1, and when it is YES, it will be judged whether this optical disk is CD-ROM or it is DA (digital audio) (S2). Here, when a disk is DA, DA regeneration is performed as it is (S3), and in being CD-ROM, the predetermined address a of a truck is made to usually seek the pickup section 4 based on the information on the storage section 11, and it measures the rotation period of the disk 1 rotation in (S4) and this portion (S5).

[0024] Judgment whether the pickup section 4 accessed the predetermined address is performed by seeing the output value of an address decoder 9. Here, if the measurement procedure of a rotation period is explained based on drawing 5 , the address which the pickup section 4 has accessed now will be read first (SS1), and this address will judge whether it is the initial address (SS2). The initial address shows the sector of the beginning of for example, each truck here.

[0025] When the read address is not the initial address, after reading the following address and clearing the timer 14 of a control section 10 one by one in the case of the initial address, it is made to start, and time is measured (SS3). Then, it judges whether the address was read (SS4) and it became the sector of the address after disk 1 rotation, i.e., the last of a truck, (SS5). And if a disk rotates one time, a timer 14 will be made to stop and the timer value at this time will become the rotation period in Address a, for example, Ta, (SS6). In addition, storage maintenance of this rotation period Ta is carried out temporarily.

[0026] Thus, if a rotation period is measured, will return to the flow again shown in drawing 4 , the address b between the addresses at [at1 and] 2 of the truck currently recorded at the low record transfer rate next will be made to seek the pickup section 4

(S6), and the rotation period of an optical disk will be measured at the same process with drawing 5 having explained here (S7). The rotation period in this address is set to T_b . When this optical disk is regular, since the record transfer rate of the field in this address b is low, the rotation period T_b becomes short. And for example, the following formula (1) is calculated by the comparator 13, and it asks for the rate of change of a rotation period, and judges whether this rate of change is less than the predetermined set point H (S8).

[0027]

$(T_b - T_a) / T_a \dots\dots\dots (1)$

[0028] What is necessary is just to choose the value of abbreviation middle of the value when giving the value when giving rotation period T_b' in the address b in the case of the disk (irregular disk) with which all trucks are recorded at the fixed record transfer rate as this predetermined value H to the above-mentioned formula 1, and the rotation period T_b of a regular disk to the above-mentioned formula 1.

[0029] The value calculated by the formula 1 is equal to the set point H as a result of this judgment, or since it means that the portion by which the record transfer rate is partially recorded low all over the truck exists in being smaller than this (YES), a control section 10 recognizes it as it being a regular disk (S9), and continues reproduction operation as it is. On the other hand, when the value calculated by the formula 1 is larger than the set point H , since it means that the record transfer rate of the portion corresponding to Address b is not low as compared with the circumference, to (NO), it will be recognized as a control section 10 being an irregular disk (S10), and copy prevention measures, such as disk discharge operation, will be taken to it (S11).

[0030] Thus, the low record area of a record transfer rate is established in the portion of the address as which some optical disks were determined beforehand, and it can distinguish whether an optical disk is regular or it is the irregular thing made [copy] by comparing the rate of change of the rotation period of this portion with other portions.

[0031] For example, if it is going to read with the usual CD-ROM drive etc. in order to copy the information on an optical disk which was mentioned above, on main data, since it has not manipulated at all, it can copy to CD write-once disk etc. correctly, and an error will not come out, either. Since change of the above rotation periods will not be detected if such a copy disk is played with the equipment of this invention, since the portion with a low record transfer rate cannot be reproduced even if it can reproduce main data, it is recognized as an irregular disk and it becomes impossible and to reproduce, although many duplicate disks can be manufactured by using this copy disk as a master disc.

Therefore, prevention of a copy can be aimed at.

[0032] Moreover, if it is in the above optical disks, since the code is not necessarily written to main data, analysis is difficult. And even if a contaminant and a blemish are attached to a disk front face, unlike the copy prevention measure of a pit unit, endurance can be made high to these.

[0033] In addition, although it asked for the rate of change of a rotation period in the above-mentioned example when two rotation periods were compared, it is not limited to the comparison method mentioned above when the rotation period was the method that it could recognize whether it is changing linearly, but what comparison method may be used. Moreover, although the above-mentioned example explained the case where the record transfer rate of some trucks was made smaller than other portions, it changes into

this and you may make it set up a record transfer rate more greatly than other portions. [0034] Furthermore, although the above-mentioned example explained the case where an optical disk rotated by the Constant Linear Velocity, it is not limited to this but, also in the case of a CAV (Constant Angular Velocity) method, of course, can apply. In this case, since the rotation period of the portion becomes small as compared with other portions when the record transfer rate is set up small partially, for example, distinction becomes possible easily.

[0035]

[Effect of the Invention] As explained above, according to the regenerative apparatus of the optical disk of this invention, the operation effect which was excellent as follows can be demonstrated. It faces playing the regular optical disk which prepared the recording track from which the record transfer rate differed in part, and since it was made to compare with the rotation period of a portion and the rotation period of the portion of other usual record transfer rates from which the record transfer rate differed, it can distinguish easily whether it is a regular optical disk. Moreover, since this invention is employable only by rewriting of the software in a regenerative apparatus, there is no burden of hardware and it is advantageous on cost. Furthermore, the rotation period is measured in the state where the good servo of rotational accuracy was applied, and moreover, since timer precision is also high, the reliability of detection can be raised

TECHNICAL FIELD

[Industrial Application] this invention relates to the regenerative apparatus with which optical disks, such as CD-ROM (compact disk ROM) information, such as for example, TV (television) game, was remembered to be, confirm whether to be a regular thing, and prevent an illegal copy.

PRIOR ART

[Description of the Prior Art] In conformity with the specification exhibited ["ISO /9660"], formatting of many of optical disks, such as present, for example, CD-ROM etc., is carried out. Stopping the reproduction etc. is performed noting that various kinds of software, such as TV game, will be regular disks if a limit joins the illegal copy prevention measure, for example, the code for copy prevention is recorded beforehand and there is the code at the time of reproduction, and it will be inaccurate copy disks if the code does not exist, when formatting is carried out in conformity with the specification exhibited as mentioned above, although the illegal copy should be prevented from the standpoint of the protection of copyrights.

[0003] However, if the copy machine which copies the data currently written to the logic specification the whole round head with such an illegal copy prevention measure is manufactured, it can copy easily and will not be a not much effective method.

[0004] Although many were making and producing original specification commercially since it was before the above-mentioned specification was materialized, if it was in CD-ROM produced comparatively commercially early, that by which CD-ROM produced commercially now followed this specification becomes in use. Then, weak CD of a copy protection will appear on the market, infestation of an illegal copy is caused, and it is

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, according to the regenerative apparatus of the optical disk of this invention, the operation effect which was excellent as follows can be demonstrated. It faces playing the regular optical disk which prepared the recording track from which the record transfer rate differed in part, and since it was made to compare with the rotation period of a portion and the rotation period of the portion of other usual record transfer rates from which the record transfer rate differed, it can distinguish easily whether it is a regular optical disk. Moreover, since this invention is employable only by rewriting of the software in a regenerative apparatus, there is no burden of hardware and it is advantageous on cost. Furthermore, the rotation period is measured in the state where the good servo of rotational accuracy was applied, and moreover, since timer precision is also high, the reliability of detection can be raised.

OPERATION

[Function] Since this invention was constituted as mentioned above, it first seeks the address of some trucks with which the usual truck of an optical disk probably differs from the rate based on the address in the storage section, respectively, and measures the rotation period of the optical disk in each of these addresses by the measurement section. The measured rotation period is compared based on a predetermined formula in a comparator. It is judged that a control section is an optical disk inaccurate if the comparison result to be produced as a result of the above-mentioned comparison if the record transfer rate is changing is shown, when it judges that it is a regular optical disk and the other comparison result is shown since the regular optical disk is recorded on a part for predetermined address part at the record transfer rate from which other portions differed here. As an example of the process of this judgment, in the case of a CLV (Constant Linear Velocity) method, it asks for a rotation period, for example, and whether the rate of change of this rotation period is larger than a predetermined value performs judgment about an optical disk.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] however, the software which reads the usual CD-ROM even if it writes it including a pit as mentioned above even though it writes the code for copy protections based on specification, and it writes a format by the original standard or -- if -- even if it was the case where it could not read, the data in the frame unit of a lower level etc. were read, and according to the copy machine copied to a CD-write-once disk etc., there was a problem that any disks will be copied

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detected, it not only needs strict management from usually forming this pseudo-pit smaller than a pit, and mass-producing, but there was a trouble that detection reliability will also fall. In addition, although the technology which assigned a transfer rate field which is different according to amount of information to the disk with which two or more record transfer rates are intermingled is also developed as related technology as indicated by JP,4-353631,A, this aims at raising optical disk record efficiency, and is not what took a copy prevention measure.

[0008] this invention is originated paying attention to the above troubles that this should be solved effectively, and the purpose is in offering the regenerative apparatus of the optical disk which can prevent an illegal copy certainly.

MEANS

[Means for Solving the Problem] The inside of the truck which arranged many pit trains the shape of a concentric circle, and in the shape of a spiral, and was formed in order that this invention might solve the above troubles, In the regenerative apparatus which plays the optical disk with which the record transfer rate of some trucks differs from the record transfer rate of the usual truck The storage section which memorizes the address currently recorded at a different record transfer rate from the address currently recorded at the record transfer rate of the usual truck, and this record transfer rate, The measurement section which measures the rotation period of the aforementioned optical disk in the two aforementioned addresses, It has the comparator which compares the aforementioned rotation period measured in this measurement section based on a predetermined formula, and the control section which judges whether the aforementioned optical disk is regular based on the comparison result of this comparator.

EXAMPLE

[Example] Below, one example of the regenerative apparatus of the optical disk concerning this invention is explained in full detail based on an accompanying drawing. The block block diagram showing the regenerative apparatus of the optical disk which drawing 1 requires for this invention, the outline plan showing the optical disk by which drawing 2 is reproduced with this invention equipment, and drawing 3 are graphs which show the relation between the address of a regular optical disk, and a rotation period.

[0012] As shown in drawing 2 , this optical disk 1 has the truck 2 which arranged many pit trains the shape of a concentric circle, and in the shape of a spiral, and was formed. In the example of illustration, the truck arranged in the shape of a spiral is shown. For example, pit density is smaller than previous pit density, truck 2B of at2 is carried out, specific address at1, for example, address, and truck 2A of the greater part of this truck 2 is recorded at the low record transfer rate, although pit density is enlarged and is recorded at the usual high record transfer rate. Although truck 2B recorded at the low record transfer rate is a part for 1 from the address at1 to at2, or a multiple track and at2 is a part for one truck from the address at1 in the example of illustration, you may make it form this truck over two or more rotations. Thus, let the optical disk which has TORATSU

recorded at a partially different record transfer rate from the periphery be a regular thing. [0013] Although the regenerative apparatus concerning this invention is used in order to play this optical disk, the judgment function which judges whether an optical disk is regular is prepared in this regenerative apparatus. First, installation fixation of the optical disk 1 is carried out at the turntable for which rotation of a spindle motor 3 was attained and which is not illustrated. And the pickup section 4 has the optical system which equipped the interior with the laser oscillation machine or the lens 5, and reads the recording information of an optical disk side by the laser beam 6.

[0014] The servo processing section 7 consists of focal section 7A and tracking section 7B which control the drive of the pickup section 4, and driver section 7C which controls the drive of a spindle motor 3, and it can control the rotational speed of an optical disk by the CLV (Constant Linear Velocity) method proper while it performs focusing and the tracking of the pickup section 4 to an optical disk 1.

[0015] The data output of the pickup section 4 is connected to the above-mentioned servo processing section 7 and the signal-processing section 8, respectively. This signal-processing section 8 is a portion which regenerates a picture signal, an audio signal, etc., and has the address decoder 9 grade as the digital-error correction section and the address recognition section of a PLL (Phase Locked-Loop) circuit, an EFM (Eight to Fourteen Modulation) decoder, and a CIRC (Cross Interleave Reed-Solomon Code) method which is not illustrated inside.

[0016] As for these signal-processing section 8 and the above-mentioned servo processing section 7, the operation is controlled by the control section 10 which consists of a microcomputer etc. The storage section 11 which records the specific address a of the usual truck 2A currently recorded at the high record transfer rate and the specific address b of the truck 2Bs currently recorded at the record transfer rate lower than the above-mentioned record transfer rate and which consists of a ROM etc., for example, and the measurement section 12 which measure the rotation period of the above-mentioned optical disk 1 in each above-mentioned addresses a and b are connected to this control section 10. The above-mentioned specific address b is located among the addresses at [at1 and] 2 so that clearly also from drawing 3 . Furthermore, if two measurement values measured in the above-mentioned measurement section 12 are compared based on a predetermined formula, the comparator 13 will be connected to this control section 10, and based on this comparison result, the above-mentioned control section 10 judges whether the above-mentioned optical disk 1 is regular. Moreover, this control section 10 has the timer 14 for a time check inside.

[0017] Next, operation of this example constituted as mentioned above is explained. Let the optical disk which record transfer rates differed in the middle of the truck, for example, the record area made small exists as a regular optical disk is shown in drawing 2 , and includes the other optical disk, for example, all trucks, here, and is recorded at the same record transfer rate be an irregular thing.

[0018] In this example, taking the case of the case where it is the Constant Linear Velocity by which disk rotation is controlled so that the rotational speed falls and the linear velocity of a truck always becomes fixed, it explains as the seeking position of the pickup section goes to the method of the outside of radial of an optical disk. First, the laser beam 6 condensed through the lens 5 from the pickup section 4 is irradiated by the optical disk side, and recording information is read by the reflected light. This read-out

signal is inputted into the servo processing section 7, and this servo processing section 7 performs control of the focusing and the tracking over the optical disk 1 of the above-mentioned pickup section 4 based on the focal error signal and tracking error signal which are formed here. Simultaneously, this servo processing section 7 carries out CLV control of the spindle motor 3 based on the instructions from a control section 10.

[0019] Moreover, it is inputted also into the signal-processing section 8, and EFM decoding is carried out, or it corrects a digital error and an audio-visual signal etc. is reproduced, and it is read in this signal-processing section 8, or the informational address is also decoded and the signal read in the pickup section 4 is searched for.

[0020] Next, the case where it is confirmed whether the optical disk 1 used now is regular is explained. First, by being alike therefore, if the recording information of this optical disk is reproduced, since [whose an address value go to the right from the left of a horizontal axis, and increases as shown in drawing 3] it is a Constant Linear Velocity, rotational speed will fall, and a rotation period will rise and go with time. In addition, as for the truck by the side of the center of an optical disk, in this example, the address value is small.

[0021] Since the record transfer rate is small set up from the address at1 to at2 here in the case of the regular optical disk, in order to make a transfer rate regularity, the rotational speed of a disk goes up by this portion, consequently a rotation period falls in it. And when the field between the addresses at [at1 and] 2 is passed, a disk will return to the original rotation period. In drawing 3, an alternate long and short dash line is crossed to all trucks, and shows transition of the rotation period of an optical disk, i.e., an irregular optical disk, when a record transfer rate is fixed.

[0022] Therefore, the right or wrong of an optical disk can be judged by comparing the rate of change of for example, a rotation period for the rotation period in predetermined Address b, for example, address, of the trucks where the rotation period (inverse number of rotational speed) in predetermined Address a, for example, address, of the trucks where the usual record transfer rate is high and a record transfer rate are low in a predetermined formula.

[0023] If the procedure in check mode is explained based on drawing 4 and drawing 5, it is judged first whether the optical disk was set in S1, and when it is YES, it will be judged whether this optical disk is CD-ROM or it is DA (digital audio) (S2). Here, when a disk is DA, DA regeneration is performed as it is (S3), and in being CD-ROM, the predetermined address a of a truck is made to usually seek the pickup section 4 based on the information on the storage section 11 (S4), and it measures the rotation period of the disk 1 rotation in this portion (S5).

[0024] Judgment whether the pickup section 4 accessed the predetermined address is performed by seeing the output value of an address decoder 9. Here, if the measurement procedure of a rotation period is explained based on drawing 5, the address which the pickup section 4 has accessed now will be read first (SS1), and this address will judge whether it is the initial address (SS2). The initial address shows the sector of the beginning of for example, each truck here.

[0025] When the read address is not the initial address, after reading the following address and clearing the timer 14 of a control section 10 one by one in the case of the initial address, it is made to start, and time is measured (SS3). Then, it judges whether the address was read (SS4) and it became the sector of the address after disk 1 rotation, i.e.,

the last of a track, (SS5). And if a disk rotates one time, a timer 14 will be made to stop and the timer value at this time will become the rotation period in Address a, for example, Ta, (SS6). In addition, storage maintenance of this rotation period Ta is carried out temporarily.

[0026] Thus, if a rotation period is measured, will return to the flow again shown in drawing 4, next the address b between the addresses at [at1 and] 2 of the track currently recorded at the low record transfer rate will be made to seek the pickup section 4 (S6), and the rotation period of an optical disk will be measured at the same process with drawing 5 having explained here (S7). The rotation period in this address is set to Tb. When this optical disk is regular, since the record transfer rate of the field in this address b is low, the rotation period Tb becomes short. And for example, the following formula (1) is calculated by the comparator 13, and it asks for the rate of change of a rotation period, and judges whether this rate of change is less than the predetermined set point H (S8).

[0027]

$(Tb - Ta) / Ta \dots\dots\dots (1)$

[0028] What is necessary is just to choose the value of abbreviation middle of the value when giving the value when giving rotation period Tb' in the address b in the case of the disk (irregular disk) with which all tracks are recorded at the fixed record transfer rate as this predetermined value H to the above-mentioned formula 1, and the rotation period Tb of a regular disk to the above-mentioned formula 1.

[0029] The value calculated by the formula 1 is equal to the set point H as a result of this judgment, or since it means that the portion by which the record transfer rate is partially recorded low all over the track exists in being smaller than this (YES), a control section 10 recognizes it as it being a regular disk (S9), and continues reproduction operation as it is. On the other hand, when the value calculated by the formula 1 is larger than the set point H, since it means that the record transfer rate of the portion corresponding to Address b is not low as compared with the circumference, to (NO), it will be recognized as a control section 10 being an irregular disk (S10), and copy prevention measures, such as disk discharge operation, will be taken to it (S11).

[0030] Thus, the low record area of a record transfer rate is established in the portion of the address as which some optical disks were determined beforehand, and it can distinguish whether an optical disk is regular or it is the irregular thing made [copy] by comparing the rate of change of the rotation period of this portion with other portions.

[0031] For example, if it is going to read with the usual CD-ROM drive etc. in order to copy the information on an optical disk which was mentioned above, on main data, since it has not manipulated at all, it can copy to CD write-once disk etc. correctly, and an error will not come out, either. Since change of the above rotation periods will not be detected if such a copy disk is played with the equipment of this invention, since the portion with a low record transfer rate cannot be reproduced even if it can reproduce main data, it is recognized as an irregular disk and it becomes impossible and to reproduce, although many duplicate disks can be manufactured by using this copy disk as a master disc. Therefore, prevention of a copy can be aimed at.

[0032] Moreover, if it is in the above optical disks, since the code is not necessarily written to main data, analysis is difficult. And even if a contaminant and a blemish are attached to a disk front face, unlike the copy prevention measure of a pit unit, endurance

can be made high to these.

[0033] In addition, although it asked for the rate of change of a rotation period in the above-mentioned example when two rotation periods were compared, it is not limited to the comparison method mentioned above when the rotation period was the method that it could recognize whether it is changing linearly, but what comparison method may be used. Moreover, although the above-mentioned example explained the case where the record transfer rate of some trucks was made smaller than other portions, it changes into this and you may make it set up a record transfer rate more greatly than other portions.

[0034] Furthermore, although the above-mentioned example explained the case where an optical disk rotated by the Constant Linear Velocity, it is not limited to this but, also in the case of a CAV (Constant Angular Velocity) method, of course, can apply. In this case, since the rotation period of the portion becomes small as compared with other portions when the record transfer rate is set up small partially, for example, distinction becomes possible easily.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block block diagram showing the regenerative apparatus of the optical disk concerning this invention.

[Drawing 2] It is the outline plan showing the optical disk played with this invention equipment.

[Drawing 3] It is the graph which shows the relation between the address of a regular optical disk, and a rotation period.

[Drawing 4] It is the flow chart which shows the procedure for an optical disk confirming whether to be a regular thing.

[Drawing 5] It is the flow chart which shows the procedure when measuring the rotation period of an optical disk.

[Description of Notations]

1 [-- The pickup section, 5 / -- A lens, 6 / -- A laser beam, 7 / -- The servo processing section, 8 / -- The signal-processing section, 9 / -- An address decoder, 10 / -- A control section, 11 / -- The storage section, 12 / -- The measurement section, 13 / -- A comparator, 14 / -- A timer, a, b, at1, at2 / -- Address.] -- An optical disk, 2 -- A truck, 4

DRAWINGS
